# CITY OF CASCADE (PWS 4430012)
# SOURCE WATER ASSESSMENT FINAL REPORT

**July 31, 2001**

## State of Idaho
## Department of Environmental Quality

## Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the Act. This assessment is based on a land use inventory of the designated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

This report, *Source Water Assessment for City of Cascade, Idaho*, describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The City of Cascade drinking water system includes three ground water well sources. Although Well #2 is the best producer, production is rotated to each of the three wells on a regular basis. All three wells have moderate ratings for hydrologic sensitivity and low ratings for system construction. As outlined in the Ground Water Susceptibility Report found at the end of this report, land use factors are the main cause for an overall moderate risk rating for all the wells. The four potential contaminant categories used in this report include inorganic contamination (IOC), volatile organic contamination (VOC), synthetic organic contamination (SOC) and Microbials. Although a trace amount of the IOCs fluoride and cyanide were detected in a composite water sample taken from Cascade's water storage tank in 1994, subsequent water chemistry tests have recorded no significant problems with the City of Cascade well water.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

For the City of Cascade, source water protection activities should focus on implementation of best management practices aimed at protecting the wellheads and surface seals within the zone immediate to the wells. Urban and residential runoff should be monitored. Since Cascade Reservoir plays a major role in groundwater recharge for the City of Cascade's drinking water it is essential that the City take every effort to assure that surface water body's protection. While spill prevention should be the focus for good water quality, any spills and accidents from businesses within the jurisdiction of the City and the reservoir should be closely monitored and dealt with. Some of the source water protection designated areas are outside the direct jurisdiction of the City of Cascade. Partnerships with state and local agencies and industry groups should be established and are critical to success. Disinfection practices should be maintained to reduce the risk of microbial contamination since there are numerous septic systems in the area. Care and maintenance workshops should be considered for residents with septic systems who live in the delineation zones for Wells #1 and #3. Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. Source water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the Valley Soil and Water Conservation District, and the Natural Resources Conservation Service.

A community with a fully developed source water protection program will incorporate many strategies. For assistance in developing protection strategies please contact the Boise Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

# SOURCE WATER ASSESSMENT FOR CITY OF CASCADE, IDAHO

## Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are attached. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is attached.

### Background

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area and sensitivity factors associated with the wells and aquifer characteristics.

### Level of Accuracy and Purpose of the Assessment

Since there are over 2,900 public water sources in Idaho, there is limited time and resources to accomplish the assessments. All assessments must be completed by May of 2003. An in-depth, site-specific investigation of each significant potential source of contamination is not possible. **Therefore, this assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. The Idaho Department of Environmental Quality (DEQ) recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

## Section 2. Conducting the Assessment

### General Description of the Source Water Quality

The public drinking water system for the City of Cascade is comprised of three wells. The community wells serve approximately 1,410 people and approximately 605 connections. All three wells are located in Valley County, at the south end of Cascade Reservoir (Figure 1).

No significant water chemistry problems have been recorded in relation to the public water system. In 1994, the IOCs fluoride and cyanide were detected in a sample taken from the water storage tank, but at levels well below the Maximum Contaminant Level (MCL). There is no known source for cyanide in the area and it is highly likely that the trace amount of cyanide reported was due to a sampling or analysis error. No detections of microbials, VOCs or SOCs have been recorded for the City of Cascade wells.

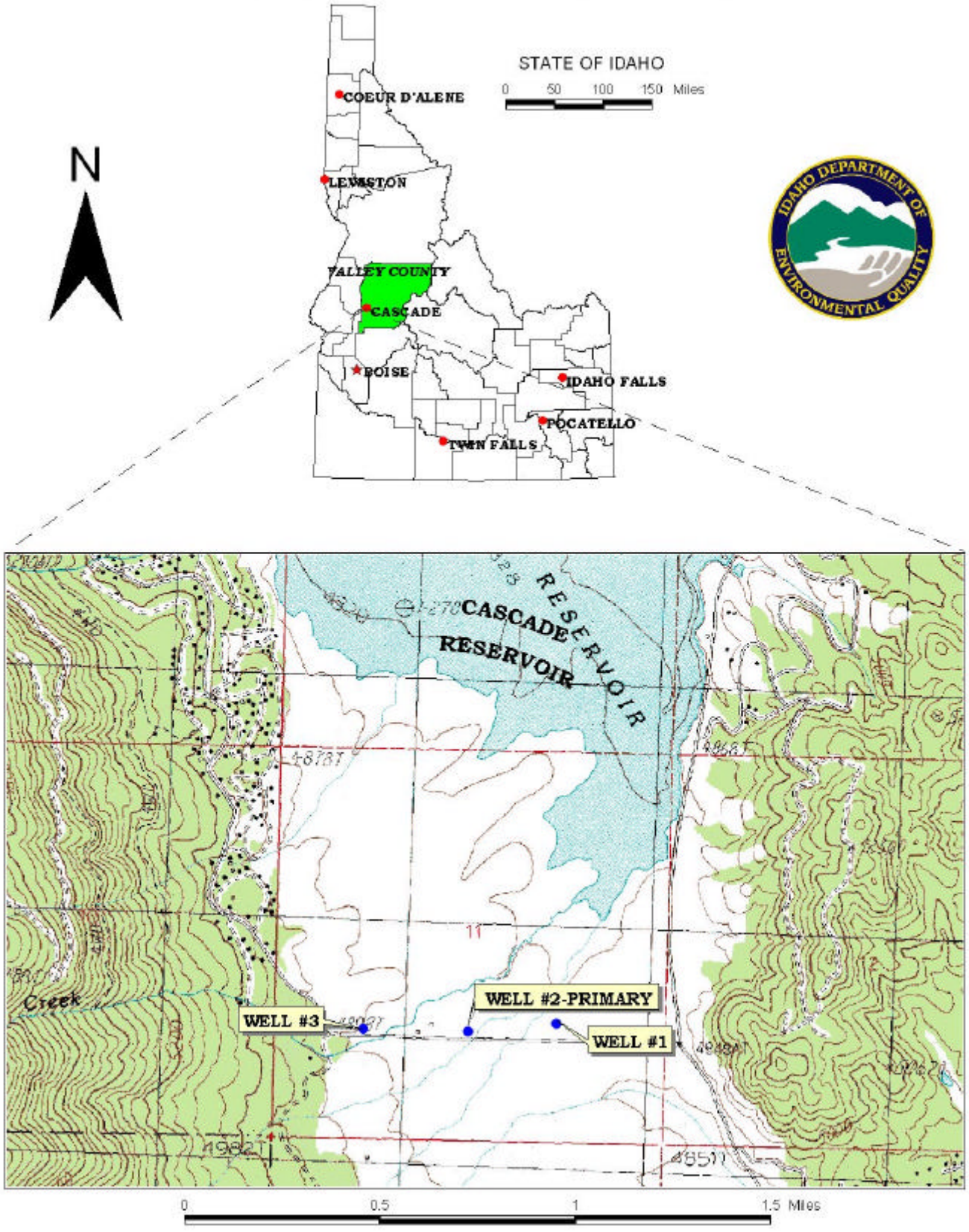
### Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. DEQ used a refined computer model approved by the EPA in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT for water associated with the glacial sediment aquifer in the vicinity of the City of Cascade. The computer model used site specific data, assimilated by DEQ from a variety of sources including the City of Cascade well logs, other local area well logs, and hydrogeologic reports summarized below.

All three wells in the City of Cascade system take their water from upper units of the very thick (7000'+) sequence of fluvial and glacial sediments that dominate the Cascade/Long Valley area. The aquifer has lateral boundaries formed by the mountain range to the west and the hills to the southeast. (Ralston, 1993). The groundwater conductivity of the valley sediments is at least an order of magnitude greater than the granitic rocks of the Idaho Batholith that boarder Long Valley (Parliman, 1980). Regional ground water recharge appears to follow Cascade Reservoir and Payette River valley from north to south. Ralston (1993) concluded that the aquifer "may also be hydraulically connected to Cascade Reservoir."

The delineated source water assessment areas for the City of Cascade Wells can best be described as corridors approximately ½ to 1 mile wide and 2 miles long extending north along the west flank of Cascade Reservoir and beneath the reservoir bounded by the granitic Idaho Batholith formations of the mountains to the west and the hills to the southeast (Figures 2, 3, 4). The actual data used by DEQ in determining the source water assessment delineation areas are available upon request.

***FIGURE 1. Geographic Location of the City of Cascade***



## Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act and has a sufficient likelihood of releasing such contaminants at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. The locations of potential sources of contamination within the delineation areas were obtained by field surveys conducted by DEQ and from available databases.

The dominant land use outside the City of Cascade area is irrigated agriculture and the Cascade Reservoir. Land use within the immediate area of the wellheads consists of irrigated pastureland.

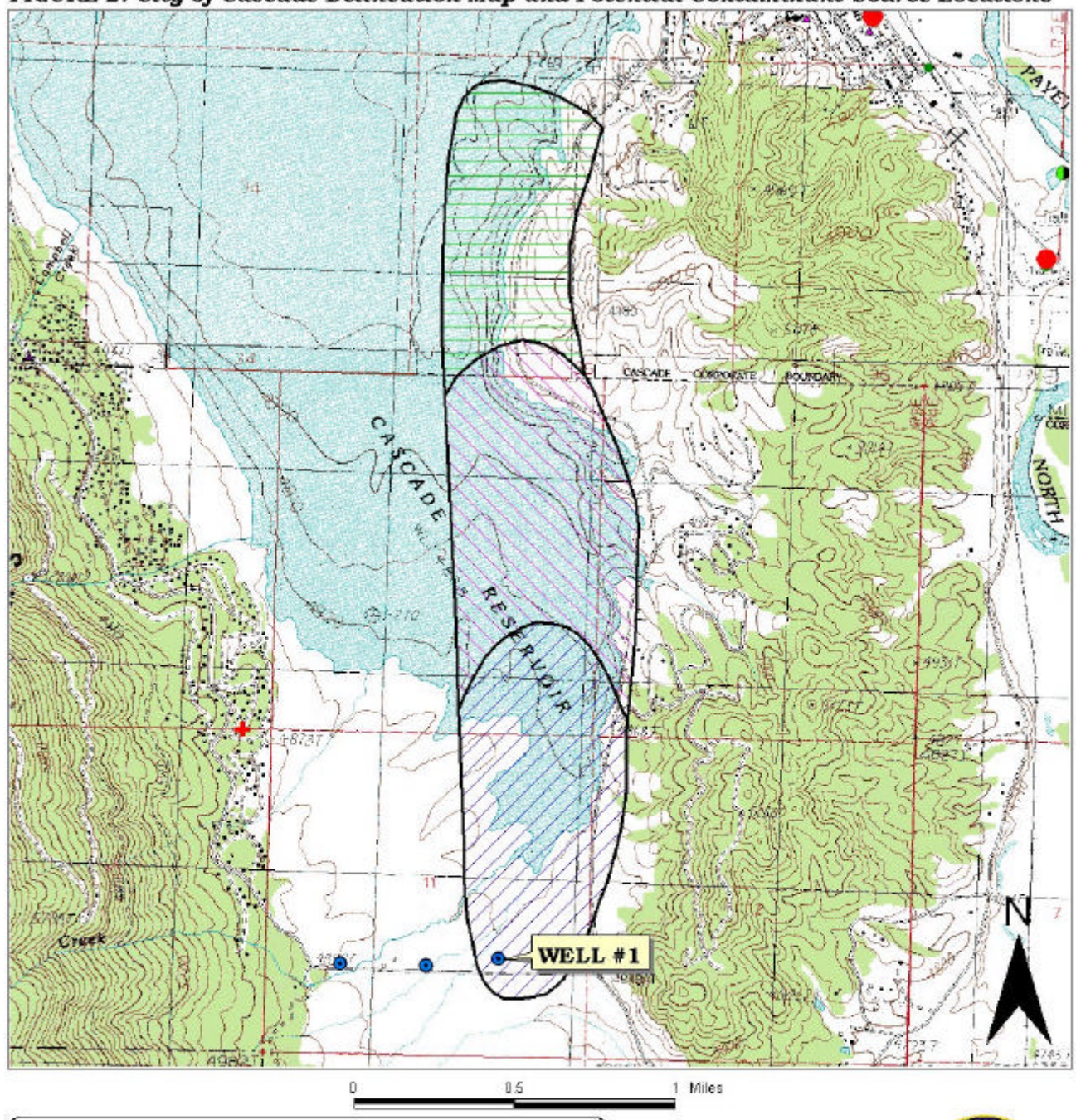
It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination. These involve educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

## Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted from December 2000 to January 2001. The first phase involved identifying and documenting any potential contaminant sources within the City of Cascade Source Water Assessment Area through the use of computer databases and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to validate the sources identified in phase one and to add any additional potential sources in the area.

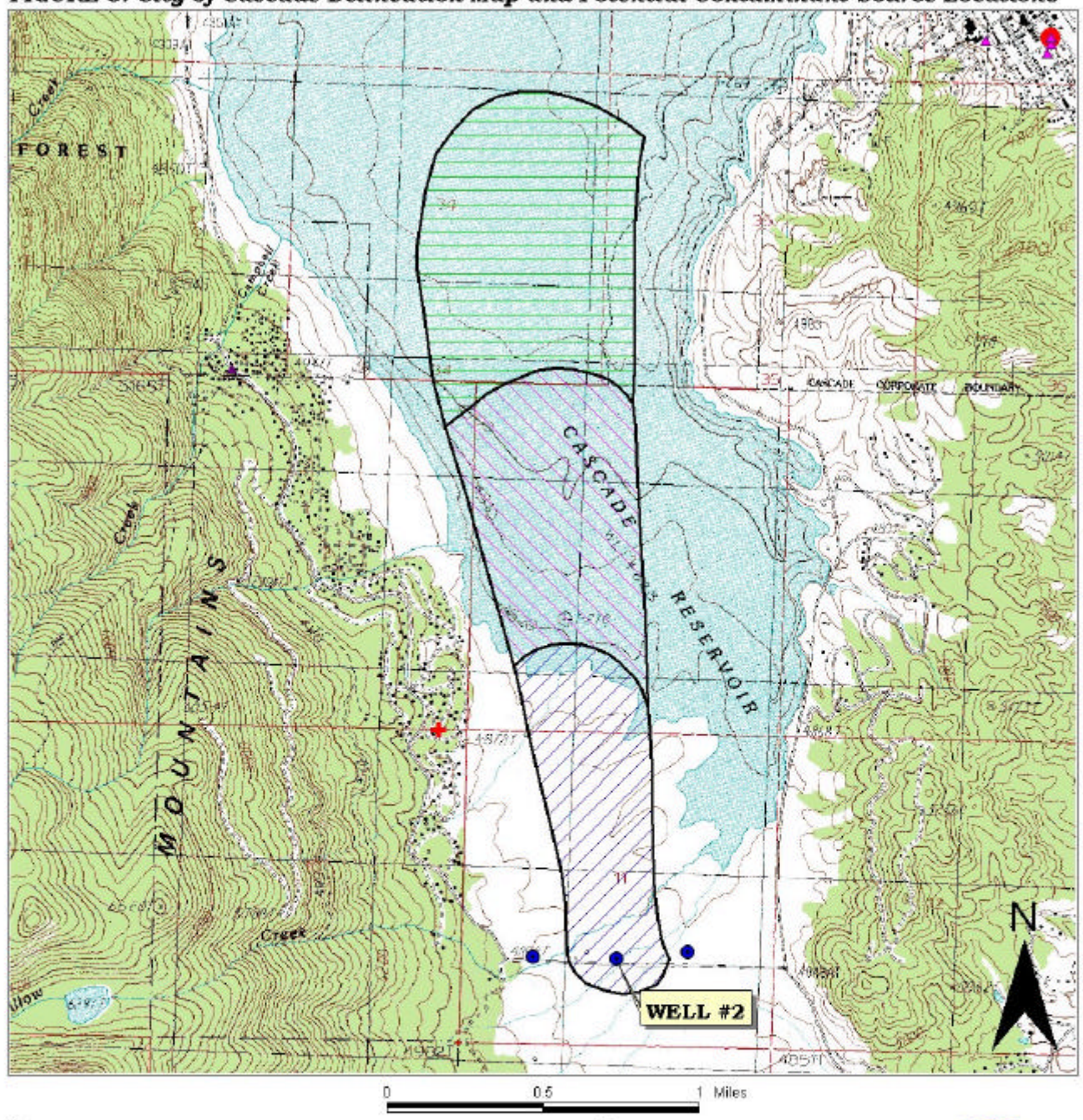
As a result of inventory research for all three wells no potential contaminant sources, other than the Cascade Reservoir, were identified for Well #1 or Well #2 and a single potential contaminant source was identified for Well #3. This single source is an underground storage tank (Table 1, Figure 4). Regional knowledge of the area resulted in the septic tank systems of the residences on the western side of the reservoir to be identified as well.

***FIGURE 2. City of Cascade Delineation Map and Potential Contaminant Source Locations***




**PWS# 4430012**
**WELL #1**

***FIGURE 3. City of Cascade Delineation Map and Potential Contaminant Source Locations***




**LEGEND**

Time of Travel Zones
- 1 (3 yr TOT)
- 2 (6 yr TOT)
- 3 (10 yr TOT)
- Wellhead
- Enhanced Inventory
- CERCLIS Site
- RCRIS Site
- Dairy
- LUST Site
- Closed UST Site
- Open UST Site
- Business Mailing List
- NPDES Site
- Mine
- AST
- Toxic Release Inventory
- SARA Title III Site (EPCRA)
- Recharge Point
- Injection Well
- Group1 Site
- Cyanide Site
- Landfill
- Wastewater Land App.Site

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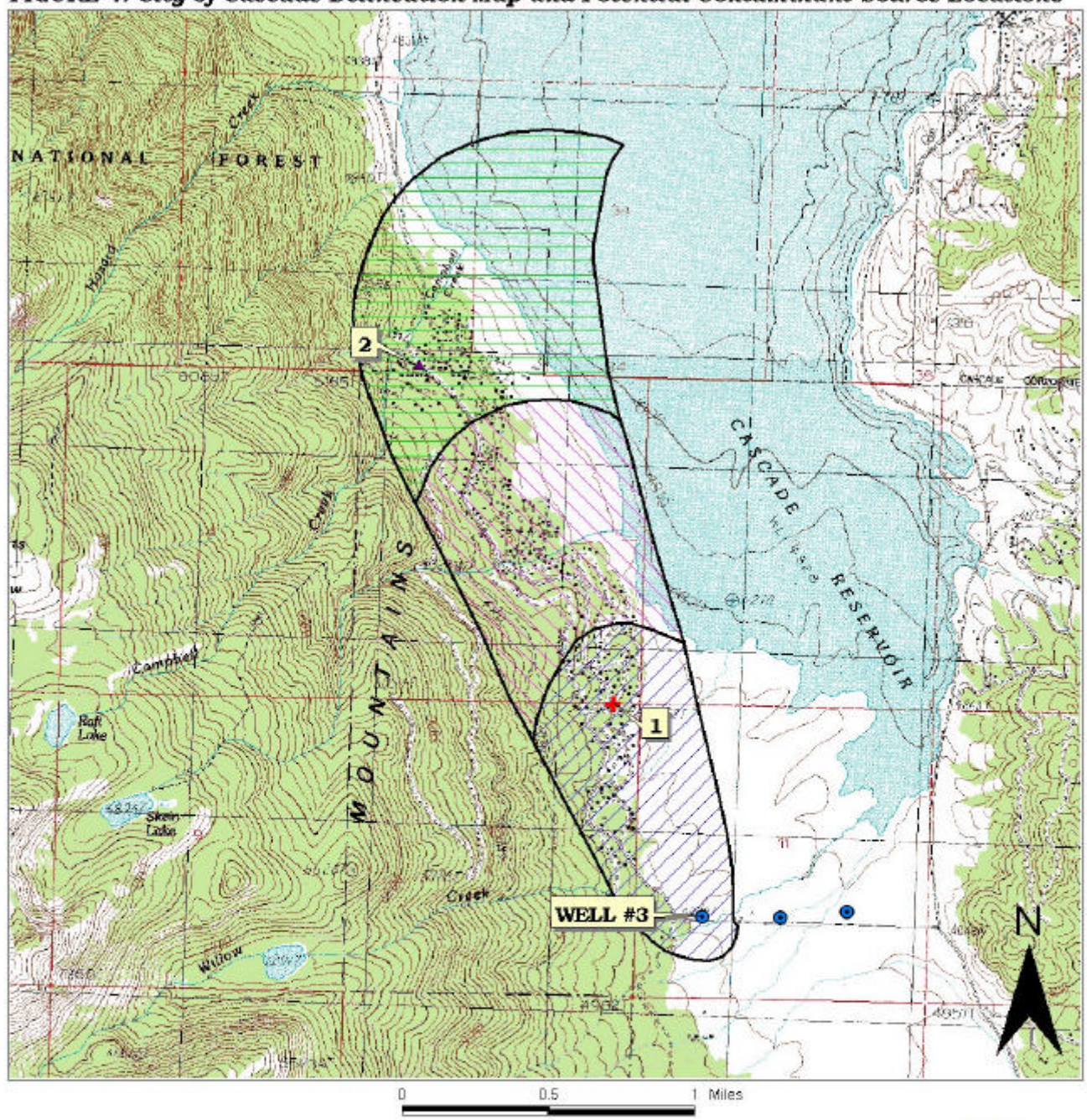
**PWS# 4430012**
**WELL #2-PRIMARY**

***FIGURE 4. City of Cascade Delineation Map and Potential Contaminant Source Locations***




**LEGEND**

Time of Travel Zones
- 1 (3 yr TOT)
- 2 (6 yr TOT)
- 3 (10 yr TOT)
- Wellhead
- Enhanced Inventory
- CERCLIS Site
- RCRIS Site
- Dairy
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- Open UST Site
- Business Mailing List
- NPDES Site
- Mine
- AST
- Toxic Release Inventory
- SARA Title III Site (EPCRA)
- Recharge Point
- Injection Well
- Group1 Site
- Cyanide Site
- Landfill
- Wastewater Land App.Site

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**PWS# 4430012**
**WELL #3**

**Table 1. City of Cascade Well #3, Potential Contaminant Inventory**

| SITE # | Source Description[1] | TOT Zone[2] (years) | Source of Information | Potential Contaminants[3] |
|---|---|---|---|---|
| | Septic Systems | 0-3 | Enhanced Inventory | IOC, Microbial |
| 1 | UST | 6-10 | Database Search | IOC,VOC, SOC |
| | Cascade Reservoir | 0-10 | GIS Map | IOC, VOC, SOC, Microbial |

**[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead**
**[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical**

## Section 3. Susceptibility Analyses

The water system's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the well, land use characteristic, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking.

### Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors: the surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone above the producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Hydrologic sensitivity is moderate for Wells #1, #2 and #3 (Table 1). This reflects the nature of the soils being in the poorly-drained to moderately-drained class, the vadose zone being made predominantly of unconsolidated alluvium, and the first ground water being located within 300 feet of ground surface. Additionally, all three wells do have laterally extensive low permeability units that could retard downward movement of contaminants.

### Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in Sanitary Surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then contamination from surface events is reduced.

The City of Cascade drinking water system consists of three wells that extract ground water for residential, commercial, and industrial uses. Although none of the wells meet recently increased casing wall thickness minimums as required by public water system (PWS) construction standards, the well system construction scores still indicate low risk for all the wells.

A sanitary survey for the three wells was completed in October 1997. Upon completion of some minor corrections all three wells were determined to be in compliance with wellhead and surface seal standards. All three wells have wood frame well houses and well casing raised at least 18 inches above floor to protect the wells from flooding. Each of the wells has a maintained wellhead seal and a downturned, screened casing vent. Well logs are available for all the wells, so a determination was made that the casing and annular seals had been extended into low permeability units.

The Well #1 log shows that the well has 0.375-inch thick, 14-inch diameter steel casing from 2 ½ feet above ground surface to the depth of 210 feet below ground surface (bgs) into a gray sandy silt zone. There is a 10-inch diameter slotted screen interval from 220 to 240 feet bgs. The water table was identified at 35 feet bgs.

The Well #2 log shows that the annular seal extends to 20 feet bgs into a low permeability clay layer. The well uses 0.375-inch thick, 12-inch diameter casing extending from 2 feet above ground to 230 feet bgs. A 10 inch diameter 0.250 inch thick casing extends from 225 to 345 feet bgs with slotted intervals from 237 – 252 feet, 270 – 280 feet, 330 – 345 feet and 375 – 380 feet for a total of 50 feet of screened interval. The water table was identified at 59 feet bgs. The discharge potential of the well is reported on the drill hole log as 750 gpm with a 23-foot drawdown after 8 ½ hours of pumping.

The Well #3 log indicates that the hole is cased with 12 inch diameter 0.375 inch thick steel from 2 feet above surface to 229 feet bgs and 6 inch diameter 0.250 inch thick steel casing from 230 feet to 430 feet bgs. Screened intervals include 249 – 259, 269 – 270, 306 – 311, 342 – 352, 365 – 375 and 382 - 392 feet bgs for a total of 22 feet of screened interval. The static water level is 73 feet bgs.

The IDWR Well Construction Standards Rules (1993) require all PWSs to follow DEQ standards as well. IDAPA 58.01.08.550 requires that PWSs follow the Recommended Standards for Water Works (1997) during construction. Table 1 of the Recommended Standards for Water Works (1997) lists the required steel casing thickness for various diameter wells. Twelve-inch diameter casing on wells requires a casing thickness of at least 0.375-inches. Casing information for all three wells indicates that some portion of the casings are only 0.250-inch thick.

**Potential Contaminant Sources and Land Use**

Due largely to irrigated agricultural land use and the Cascade Reservoir, Wells #1 and #2 rated moderate for IOCs (i.e. nitrates), SOCs (i.e. pesticides), and VOCs (i.e. petroleum products), and rated low microbial contaminants. Well #3, however, does not contain the Cascade Reservoir within the 3-year TOT, but does have potential contaminant sources. As such, Well #3 rated moderate susceptibility to IOCs, and low susceptibility to VOCs, SOCs, and microbial contamination.

The Cascade system is unique in that there are numerous residential septic systems located above the delineation zones for Well #3 (Figure 4). Although normal septic-related contamination is not likely to mix with the deeper aquifer the well intercepts, it is possible that improper use of residential septic

systems could cause drinking water contamination. Obviously, the maintenance of high water quality in Cascade Reservoir is essential to facilitate continued high water quality for the Long Valley/Round Valley Aquifer.

**Final Susceptibility Ranking**

A detection above a drinking water standard MCL, any detection of a VOC or SOC, having a potential contaminant source within 50 feet of the wellhead, or a detection of total coliform bacteria or fecal coliform bacteria at the wellhead will automatically give a high susceptibility rating to a well despite the land use of the area because a pathway for contamination already exists. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0 to 3-year time of travel zone (Zone 1B) and a large percentage of agricultural land contribute greatly to the overall ranking. In terms of total susceptibility, all the wells rate moderate for all categories.

**Table 2. Summary of City of Cascade Susceptibility Evaluation**

| Well | Susceptibility Scores[1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hydrologic Sensitivity | Contaminant Inventory | | | | System Construction | Final Susceptibility Ranking | | | |
| | | IOC | VOC | SOC | Microbials | | IOC | VOC | SOC | Microbials |
| Well #1 | M | M | M | M | L | L | M | M | M | M |
| Well #2 | M | M | M | M | L | L | M | M | M | M |
| Well #3 | M | M | L | L | L | L | M | M | M | M |

**[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility, IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical**

**Susceptibility Summary**

All three wells rate moderate to all types of contaminants. This is mainly due to the Cascade Reservoir being the primary source of water for the wells.

Although a trace amount of cyanide was detected in a composite water sample taken from the City of Cascade water storage tank in 1994, subsequent water chemistry tests have recorded no significant problems with the City of Cascade composite well water. No other contaminant detections have been recorded for the City of Cascade ground water drinking water sources. It is imperative that residential septic systems are well maintained and contaminants not be introduced to ground water that could cause harm to the deeper aquifer.

## Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

An effective source water protection program is tailored to the particular local source water protection area. A community with a fully developed source water protection program will incorporate many strategies. For the City of Cascade, source water protection activities should focus on implementation of practices aimed at protecting the area nearest the wells. The City of Cascade should also be diligent about local businesses that are regulated by the various environmental regulations (RCRA, CERCLA, SARA) or those with potential inorganic contaminants. Though water quality is generally good for the City of Cascade, the maintenance of high water quality in Cascade Reservoir is essential for continued high water quality in the area's groundwater. Any surface releases should be monitored closely to prevent contaminants from infiltrating to the ground water producing zones including the Reservoir.

Of particular concern is the high number of septic systems located within the delineation zone for Well #3. The City of Cascade should consider an educational program focused on care and maintenance of residential septic systems for residents within these areas. Please see the "Assistance" section of this report for further information.

Some of the designated source water protection areas are outside the direct jurisdiction of the City of Cascade. Partnerships with state and local agencies and industry groups should be established and are critical to success. Continued vigilance in keeping the wells protected from surface flooding can also keep the potential for contamination reduced. Due to the time involved with the movement of ground water, wellhead protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. Source water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the local Soil and Water Conservation District, and the Natural Resources Conservation Service.

**Assistance**

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Boise Regional DEQ Office (208) 373-0550

State DEQ Office (208) 373-0502

Website: http://www2.state.id.us/deq

Water suppliers serving fewer than 10,000 persons may contact John Bokor, Idaho Rural Water Association, at 1 (800) 962-3257 for assistance with wellhead protection strategies.

# POTENTIAL CONTAMINANT INVENTORY
# LIST OF ACRONYMS AND DEFINITIONS

**AST (Aboveground Storage Tanks) –** Sites with aboveground storage tanks.

**Business Mailing List –** This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

**CERCLIS –** This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

**Cyanide Site –** DEQ permitted and known historical sites/facilities using cyanide.

**Dairy –** Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

**Deep Injection Well –** Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

**Enhanced Inventory** – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

**Floodplain –** This is a coverage of the 100year floodplains.

**Group 1 Sites –** These are sites that show elevated levels of contaminants and are not within the priority one areas.

**Inorganic Priority Area –** Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

**Landfill –** Areas of open and closed municipal and non-municipal landfills.

**LUST (Leaking Underground Storage Tank)** – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

**Mines and Quarries** – Mines and quarries permitted through the Idaho Department of Lands.)

**Nitrate Priority Area –** Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

**NPDES (National Pollutant Discharge Elimination System) –** Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

**Organic Priority Areas –** These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

**Recharge Point –** This includes active, proposed, and possible recharge sites on the Snake River Plain.

**RICRIS –** Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

**SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) –** These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

**Toxic Release Inventory (TRI)** – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

**UST (Underground Storage Tank) –** Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

**Wastewater Land Applications Sites** – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

**Wellheads –** These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

**NOTE:** Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.

**References Cited**

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997. "Recommended Standards for Water Works."

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Idaho Department of Water Resources, 1993. Administrative Rules of the Idaho Water Resource Board: Well Construction Standards Rules. IDAPA 37.03.09.

Idaho Water Resource Board, 1973. Comprehensive Rural Water and Sewerage Planning Study for Washington County. U.S. Geological Survey (prepared in cooperation with University of Idaho, Washington State University and the cities of Moscow, Idaho and Pullman, Washington), Water Resources Investigations Report 89-4103, 73 p.

Lum II, W.E., J.L. Smoot, and D.R. Ralston, 1990. Geohydrology and Numerical Model Analysis of Ground-water Flow in the Pullman-Moscow Area, Washington and Idaho.

Parliman, 1980. Quality of Groundwater in the Payette River Basin, Idaho, USGS, WRI Report 86-4013.

Ralston, D.R., 1993. "Preliminary Analysis of Additional Well Development for the City of Cascade." Prepared for J-U-B Engineers, Inc., Boise, Idaho, January, 1993.

# Attachment A

# City of Cascade Susceptibility Analysis Worksheet

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) 2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Ground Water Susceptibility Report  Public Water System Name : CASCADE CITY OF  Well# : WELL #1

Public Water System Number 4430012  07/31/2001 11:33:53 AM

| 1. System Construction | | SCORE | | | | |
|---|---|---|---|---|---|---|
| Drill Date | 02/15/1990 | | | | | |
| Driller Log Available | YES | | | | | |
| Sanitary Survey (if yes, indicate date of last survey) | YES | 1997 | | | | |
| Well meets IDWR construction standards | NO | 1 | | | | |
| Wellhead and surface seal maintained | YES | 0 | | | | |
| Casing and annular seal extend to low permeability unit | YES | 0 | | | | |
| Highest production 100 feet below static water level | YES | 0 | | | | |
| Well located outside the 100 year flood plain | YES | 0 | | | | |
| Total System Construction Score | | 1 | | | | |
| **2. Hydrologic Sensitivity** | | | | | | |
| Soils are poorly to moderately drained | NO | 2 | | | | |
| Vadose zone composed of gravel, fractured rock or unknown | YES | 1 | | | | |
| Depth to first water > 300 feet | NO | 1 | | | | |
| Aquitard present with > 50 feet cumulative thickness | YES | 0 | | | | |
| Total Hydrologic Score | | 4 | | | | |
| **3. Potential Contaminant / Land Use - ZONE 1A** | | | IOC Score | VOC Score | SOC Score | Microbial Score |
| Land Use Zone 1A | RANGELAND, WOODLAND, BASALT | | 0 | 0 | 0 | 0 |
| Farm chemical use high | NO | | 0 | 0 | 0 | |
| IOC, VOC, SOC, or Microbial sources in Zone 1A | NO | | NO | NO | NO | NO |
| Total Potential Contaminant Source/Land Use Score - Zone 1A | | | 0 | 0 | 0 | 0 |
| **Potential Contaminant / Land Use - ZONE 1B** | | | | | | |
| Contaminant sources present (Number of Sources) | YES | | 1 | 1 | 1 | 1 |
| (Score = # Sources X 2 ) 8 Points Maximum | | | 2 | 2 | 2 | 2 |
| Sources of Class II or III leacheable contaminants or | YES | | 5 | 1 | 1 | |
| 4 Points Maximum | | | 4 | 1 | 1 | |
| Zone 1B contains or intercepts a Group 1 Area | NO | | 0 | 0 | 0 | 0 |
| Land use Zone 1B | Greater Than 50% Irrigated Agricultural Land | | 4 | 4 | 4 | 4 |
| Total Potential Contaminant Source / Land Use Score - Zone 1B | | | 10 | 7 | 7 | 6 |
| **Potential Contaminant / Land Use - ZONE II** | | | | | | |
| Contaminant Sources Present | YES | | 2 | 2 | 2 | |
| Sources of Class II or III leacheable contaminants or | YES | | 1 | 1 | 1 | |
| Land Use Zone II | Less than 25% Agricultural Land | | 0 | 0 | 0 | |
| Potential Contaminant Source / Land Use Score - Zone II | | | 3 | 3 | 3 | 0 |
| **Potential Contaminant / Land Use - ZONE III** | | | | | | |
| Contaminant Source Present | YES | | 1 | 1 | 1 | |
| Sources of Class II or III leacheable contaminants or | YES | | 1 | 1 | 1 | |
| Is there irrigated agricultural lands that occupy > 50% of | NO | | 0 | 0 | 0 | |
| Total Potential Contaminant Source / Land Use Score - Zone III | | | 2 | 2 | 2 | 0 |
| Cumulative Potential Contaminant / Land Use Score | | | 15 | 12 | 12 | 6 |
| **4. Final Susceptibility Source Score** | | | 8 | 7 | 7 | 7 |
| **5. Final Well Ranking** | | | Moderate | Moderate | Moderate | Moderate |

Ground Water Susceptibility Report  Public Water System Name : CASCADE CITY OF  Well# : WELL #2-PRIMARY

Public Water System Number 4430012  07/31/2001 11:34:05 AM

| 1. System Construction | | SCORE | | | | |
|---|---|---|---|---|---|---|
| Drill Date | 10/04/1996 | | | | | |
| Driller Log Available | YES | | | | | |
| Sanitary Survey (if yes, indicate date of last survey) | YES | 1997 | | | | |
| Well meets IDWR construction standards | NO | 1 | | | | |
| Wellhead and surface seal maintained | YES | 0 | | | | |
| Casing and annular seal extend to low permeability unit | YES | 0 | | | | |
| Highest production 100 feet below static water level | YES | 0 | | | | |
| Well located outside the 100 year flood plain | YES | 0 | | | | |
| Total System Construction Score | | 1 | | | | |
| **2. Hydrologic Sensitivity** | | | | | | |
| Soils are poorly to moderately drained | NO | 2 | | | | |
| Vadose zone composed of gravel, fractured rock or unknown | YES | 1 | | | | |
| Depth to first water > 300 feet | NO | 1 | | | | |
| Aquitard present with > 50 feet cumulative thickness | YES | 0 | | | | |
| Total Hydrologic Score | | 4 | | | | |
| **3. Potential Contaminant / Land Use - ZONE 1A** | | | IOC Score | VOC Score | SOC Score | Microbial Score |
| Land Use Zone 1A | RANGELAND, WOODLAND, BASALT | 0 | 0 | 0 | 0 | |
| Farm chemical use high | NO | 0 | 0 | 0 | | |
| IOC, VOC, SOC, or Microbial sources in Zone 1A | NO | NO | NO | NO | NO | |
| Total Potential Contaminant Source/Land Use Score - Zone 1A | | 0 | 0 | 0 | 0 | |
| **Potential Contaminant / Land Use - ZONE 1B** | | | | | | |
| Contaminant sources present (Number of Sources) | YES | 1 | 1 | 1 | 1 | |
| (Score = # Sources X 2 ) 8 Points Maximum | | 2 | 2 | 2 | 2 | |
| Sources of Class II or III leacheable contaminants or | YES | 5 | 1 | 1 | | |
| 4 Points Maximum | | 4 | 1 | 1 | | |
| Zone 1B contains or intercepts a Group 1 Area | NO | 0 | 0 | 0 | 0 | |
| Land use Zone 1B | Greater Than 50% Irrigated Agricultural Land | 4 | 4 | 4 | 4 | |
| Total Potential Contaminant Source / Land Use Score - Zone 1B | | 10 | 7 | 7 | 6 | |
| **Potential Contaminant / Land Use - ZONE II** | | | | | | |
| Contaminant Sources Present | YES | 2 | 2 | 2 | | |
| Sources of Class II or III leacheable contaminants or | YES | 1 | 1 | 1 | | |
| Land Use Zone II | Less than 25% Agricultural Land | 0 | 0 | 0 | | |
| Potential Contaminant Source / Land Use Score - Zone II | | 3 | 3 | 3 | 0 | |
| **Potential Contaminant / Land Use - ZONE III** | | | | | | |
| Contaminant Source Present | YES | 1 | 1 | 1 | | |
| Sources of Class II or III leacheable contaminants or | YES | 1 | 1 | 1 | | |
| Is there irrigated agricultural lands that occupy > 50% of | NO | 0 | 0 | 0 | | |
| Total Potential Contaminant Source / Land Use Score - Zone III | | 2 | 2 | 2 | 0 | |
| **Cumulative Potential Contaminant / Land Use Score** | | 15 | 12 | 12 | 6 | |
| **4. Final Susceptibility Source Score** | | 8 | 7 | 7 | 7 | |
| **5. Final Well Ranking** | | Moderate | Moderate | Moderate | Moderate | |

Ground Water Susceptibility Report  Public Water System Name : CASCADE CITY OF  Well# : WELL #3

Public Water System Number 4430012  07/31/2001 11:34:18 AM

| 1. System Construction | | SCORE | | | | |
|---|---|---|---|---|---|---|
| Drill Date | 04/15/1997 | | | | | |
| Driller Log Available | YES | | | | | |
| Sanitary Survey (if yes, indicate date of last survey) | YES | 1997 | | | | |
| Well meets IDWR construction standards | NO | 1 | | | | |
| Wellhead and surface seal maintained | YES | 0 | | | | |
| Casing and annular seal extend to low permeability unit | YES | 0 | | | | |
| Highest production 100 feet below static water level | YES | 0 | | | | |
| Well located outside the 100 year flood plain | YES | 0 | | | | |
| Total System Construction Score | | 1 | | | | |
| **2. Hydrologic Sensitivity** | | | | | | |
| Soils are poorly to moderately drained | NO | 2 | | | | |
| Vadose zone composed of gravel, fractured rock or unknown | YES | 1 | | | | |
| Depth to first water > 300 feet | NO | 1 | | | | |
| Aquitard present with > 50 feet cumulative thickness | YES | 0 | | | | |
| Total Hydrologic Score | | 4 | | | | |
| **3. Potential Contaminant / Land Use - ZONE 1A** | | | IOC Score | VOC Score | SOC Score | Microbial Score |
| Land Use Zone 1A | RANGELAND, WOODLAND, BASALT | | 0 | 0 | 0 | 0 |
| Farm chemical use high | NO | | 0 | 0 | 0 | |
| IOC, VOC, SOC, or Microbial sources in Zone 1A | NO | | NO | NO | NO | NO |
| Total Potential Contaminant Source/Land Use Score - Zone 1A | | | 0 | 0 | 0 | 0 |
| **Potential Contaminant / Land Use - ZONE 1B** | | | | | | |
| Contaminant sources present (Number of Sources) | YES | | 1 | 0 | 0 | 1 |
| (Score = # Sources X 2 ) 8 Points Maximum | | | 2 | 0 | 0 | 2 |
| Sources of Class II or III leacheable contaminants or | YES | | 3 | 0 | 0 | |
| 4 Points Maximum | | | 3 | 0 | 0 | |
| Zone 1B contains or intercepts a Group 1 Area | NO | | 0 | 0 | 0 | 0 |
| Land use Zone 1B | 25 to 50% Irrigated Agricultural Land | | 2 | 2 | 2 | 2 |
| Total Potential Contaminant Source / Land Use Score - Zone 1B | | | 7 | 2 | 2 | 4 |
| **Potential Contaminant / Land Use - ZONE II** | | | | | | |
| Contaminant Sources Present | YES | | 2 | 2 | 2 | |
| Sources of Class II or III leacheable contaminants or | YES | | 1 | 1 | 1 | |
| Land Use Zone II | Less than 25% Agricultural Land | | 0 | 0 | 0 | |
| Potential Contaminant Source / Land Use Score - Zone II | | | 3 | 3 | 3 | 0 |
| **Potential Contaminant / Land Use - ZONE III** | | | | | | |
| Contaminant Source Present | YES | | 1 | 1 | 1 | |
| Sources of Class II or III leacheable contaminants or | YES | | 1 | 1 | 1 | |
| Is there irrigated agricultural lands that occupy > 50% of | NO | | 0 | 0 | 0 | |
| Total Potential Contaminant Source / Land Use Score - Zone III | | | 2 | 2 | 2 | 0 |
| **Cumulative Potential Contaminant / Land Use Score** | | | 12 | 7 | 7 | 4 |
| **4. Final Susceptibility Source Score** | | | 7 | 6 | 6 | 7 |
| **5. Final Well Ranking** | | | Moderate | Moderate | Moderate | Moderate |